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ELECTRIC POWER SUBSTATIONS ENGINEERING

Edited by
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Preface

The electric power substation, whether generating station or transmission and distribution, remains one of the most challenging and exciting fields of electric power engineering. Recent technological developments have had tremendous impact on all aspects of substation design and operation. The objective of *Electric Power Substations Engineering* is to provide an extensive overview of the substation, as well as a reference and guide for its study. The chapters are written for the electric power engineering professional to give detailed design information, as well as for other engineering professions (e.g., mechanical, civil) who want an overview or specific information in one particular area.

The book is organized into 18 chapters to provide comprehensive information on all aspects of substations, from the initial concept of a substation to design, automation, operation, and physical and cyber security. The chapters are written as tutorials, and most provide references for further reading and study. The chapter authors are members of the Institute of Electrical and Electronics Engineers (IEEE) Power Engineering Society (PES) Substations Committee, the group that develops the standards that govern all aspects of substations. Consequently, this book contains the most recent technological developments regarding industry practice as well as industry standards. This work is a member of the Electric Power Engineering Series published by CRC Press.

During my review of the individual chapters of this book, I was very pleased with the level of detail presented and, more importantly, the tutorial writing style and use of photographs and graphics to help the reader understand the material. I thank the tremendous efforts of the 25 authors who were dedicated to do the very best job they could in writing the 18 chapters. I also thank the personnel at CRC Press who have been involved in the production of this book, with a special word of thanks to Nora Konopka, Helena Redshaw, and Michele Berman. They were a pleasure to work with and made this project a lot of fun for all of us.

John D. McDonald
Editor-in-Chief

Editor-in-Chief



John D. McDonald, P.E., is senior principal consultant and manager of automation, reliability, and asset management for KEMA, Inc. In his over 29 years of experience in the electric utility industry, McDonald has developed power application software for both supervisory control and data acquisition (SCADA) energy management system (EMS) and SCADA distribution management system (DMS) applications, developed distribution automation and load management systems, managed SCADA/EMS and SCADA/DMS projects, and assisted intelligent electronic device (IED) suppliers in the automation of their IEDs. He is currently assisting electric utilities in substation automation, distribution SCADA, communication protocols, and SCADA/DMS. McDonald received his B.S.E.E. and M.S.E.E. (power engineering) degrees from Purdue University, and an M.B.A. (finance) degree from the University of California-Berkeley. He is a member of Eta Kappa Nu and Tau Beta Pi, is a Fellow of IEEE, and was awarded the IEEE Millennium Medal in 2000, the IEEE PES Award for Excellence in Power

Distribution Engineering in 2002, and the IEEE PES Substations Committee Distinguished Service Award in 2003. In his 17 years of working group and subcommittee leadership with the IEEE PES Substations Committee, he has led 7 working groups and task forces that published standards/tutorials in the areas of distribution SCADA, master/remote terminal unit (RTU), and RTU/IED communications. He is secretary of the IEEE PES, covice chair of IEEE Standards Coordinating Committee (SCC) 36, corresponding member to IEC Technical Committee (TC) 57 Working Group (WG) 11, and the past chair of the IEEE PES Substations Committee. McDonald is a member of the advisory committee for the annual DistribuTECH Conference and the editorial board for the IEEE *Power & Energy* magazine, and he is a charter member of *T&D World* magazine's international editorial advisory board. The editor teaches a SCADA/EMS/DMS course at the Georgia Institute of Technology, a substation automation course at Iowa State University, and substation automation, distribution SCADA, and communications courses for the American Public Power Association and for various IEEE PES local chapters as an IEEE PES distinguished lecturer. McDonald has published 21 papers in the areas of SCADA, EMS, DMS, and communications, and is a registered professional engineer (electrical) in California, Pennsylvania, and Georgia. He is coauthor of the book, *Automating a Distribution Cooperative, from A to Z*, published by the National Rural Electric Cooperative Association Cooperative Research Network (CRN) in 1999. He edited the Substations Integration and Automation chapter, and authored the Substation Automation article for the book, *Electric Power Engineering Handbook*, cosponsored by the IEEE PES and published by CRC Press in 2000.

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Contents

1	How a Substation Happens	<i>James C. Burke and Anne-Marie Sahazizian</i>	
1.1	Background		1-1
1.2	Needs Determination.....		1-2
1.3	Budgeting.....		1-2
1.4	Financing		1-2
1.5	Traditional and Innovative Substation Design.....		1-2
1.6	Site Acquisition		1-3
1.7	Design, Construction, and Commissioning Process.....		1-3
2	Gas-Insulated Substations	<i>Philip Bolin</i>	
2.1	SF ₆		2-1
2.2	Construction and Service Life		2-2
2.3	Economics of GIS.....		2-17
3	Air-Insulated Substations — Bus/Switching Configurations	<i>Michael J. Bio</i>	
3.1	Single Bus (Figure 3.1)		3-1
3.2	Double Bus, Double Breaker (Figure 3.2)		3-2
3.3	Main and Transfer Bus (Figure 3.3)		3-2
3.4	Double Bus, Single Breaker (Figure 3.4)		3-3
3.5	Ring Bus (Figure 3.5)		3-4
3.6	Breaker-and-a-Half (Figure 3.6)		3-5
3.7	Comparison of Configurations		3-5
4	High-Voltage Switching Equipment	<i>David L. Harris</i>	
4.1	Ambient Conditions		4-1
4.2	Disconnect Switches.....		4-1
4.3	Load Break Switches		4-2
4.4	High-Speed Grounding Switches		4-2
4.5	Power Fuses		4-3
4.6	Circuit Switchers		4-3
4.7	Circuit Breakers.....		4-4
4.8	GIS Substations		4-6
4.9	Environmental Concerns.....		4-6

5	High-Voltage Power Electronic Substations	<i>Gerhard Juetten and Asok Mukherjee</i>	
5.1	Converter Stations (HVDC).....		5-2
5.2	FACTS Controllers.....		5-5
5.3	Control and Protection System.....		5-10
5.4	Losses and Cooling.....		5-16
5.5	Civil Works.....		5-16
5.6	Reliability and Availability.....		5-17
5.7	Future Trends.....		5-18
6	The Interface between Automation and the Substation	<i>James W. Evans</i>	
6.1	Introduction.....		6-1
6.2	Physical Considerations.....		6-2
6.3	Analog Data Acquisition.....		6-4
6.4	Status Monitoring.....		6-10
6.5	Control Functions.....		6-11
6.6	Communications Networks inside the Substation.....		6-14
6.7	Testing Automation Systems.....		6-17
6.8	Summary		6-20
7	Substation Integration and Automation	<i>John D. McDonald</i>	
7.1	Introduction.....		7-1
7.2	Definitions and Terminology.....		7-2
7.3	Open Systems		7-2
7.4	Architecture Functional Data Paths.....		7-3
7.5	Substation Integration and Automation System Functional Architecture.....		7-3
7.6	New vs. Existing Substations		7-3
7.7	Equipment Condition Monitoring		7-4
7.8	Substation Integration and Automation Technical Issues.....		7-5
7.9	Protocol Fundamentals.....		7-13
7.10	Protocol Considerations.....		7-14
7.11	Choosing the Right Protocol.....		7-17
7.12	Communication Protocol Application Areas.....		7-17
7.13	Summary		7-18
8	Oil Containment	<i>Anne-Marie Sahazizian and Tibor Kertesz</i>	
8.1	Oil-Filled Equipment in Substation [IEEE 980-1994 (R2001)]		8-2
8.2	Spill Risk Assessment		8-3
8.3	Containment Selection Consideration [IEEE 980-1994 (R2001)]		8-4
8.4	Oil Spill Prevention Techniques.....		8-5

9	Community Considerations	<i>James H. Sosinski</i>	
9.1	Community Acceptance		9-1
9.2	Planning Strategies and Design		9-2
9.3	Permitting Process		9-10
9.4	Construction		9-11
9.5	Operations		9-12
9.6	Defining Terms (IEEE, 1998)		9-13
10	Animal Deterrents/Security	<i>C.M. Mike Stine and Sheila Frasier</i>	
10.1	Animal Types.....		10-2
10.2	Mitigation Methods		10-3
11	Substation Grounding	<i>Richard P. Keil</i>	
11.1	Reasons for Substation Grounding System		11-1
11.2	Accidental Ground Circuit		11-2
11.3	Design Criteria		11-8
12	Grounding and Lightning	<i>Robert S. Nowell</i>	
12.1	Lightning Stroke Protection		12-1
12.2	Lightning Parameters.....		12-2
12.3	Empirical Design Methods		12-5
12.4	The Electrogeometric Model (EGM)		12-7
12.5	Calculation of Failure Probability		12-18
12.6	Active Lightning Terminals		12-20
13	Seismic Considerations	<i>R.P. Stewart, Rulon Fronk, and Tonia Jurbin</i>	
13.1	Historical Perspective		13-1
13.2	IEEE 693 — a Solution		13-1
13.3	Relationship between Earthquakes and Substations.....		13-2
13.4	Applicable Documents.....		13-2
13.5	Decision Process for Seismic Design Considerations		13-3
13.6	Performance Levels and Required Spectra		13-3
13.7	Qualification Process		13-10
14	Substation Fire Protection	<i>Don Delcourt</i>	
14.1	Fire Hazards		14-1
14.2	Fire Protection Measures.....		14-4
14.3	Fire Protection Selection.....		14-5
14.4	Conclusion		14-7
	Substation Control Building Fire-Protection-Review Checklist.....		14-8
	Substation Switchyard Fire Protection Assessment Process		14-9

15	Substation Communications	<i>Daniel E. Nordell</i>	
15.1	Introduction		15-1
15.2	Supervisory Control and Data Acquisition (SCADA) Historical Perspective		15-2
15.3	SCADA Functional Requirements		15-4
15.4	SCADA Communication Requirements.....		15-4
15.5	Components of a SCADA System		15-5
15.6	SCADA Communication Protocols: Past, Present, and Future		15-6
15.7	The Structure of a SCADA Communications Protocol.....		15-9
15.8	Security for Substation Communications		15-11
15.9	Electromagnetic Environment		15-14
15.10	Communications Media.....		15-15
15.11	Additional Information		15-22
16	Physical Security	<i>John Oglevie and Pat Rooney</i>	
16.1	Introduction		16-1
16.2	History		16-2
16.3	Types of Intruders.....		16-3
16.4	Substation Development		16-4
16.5	Security Methods		16-5
16.6	Security Assessment		16-11
17	Cyber Security of Substation Control and Diagnostic Systems	<i>Joseph Weiss and Martin Delson</i>	
17.1	Introduction		17-1
17.2	Definitions and Terminology.....		17-2
17.3	Threats to the Security of Substation Systems.....		17-3
17.4	Substation Automation (SA) System Vulnerabilities.....		17-4
17.5	Measures to Enhance Cyber Security.....		17-6
17.6	Devising a Security Policy.....		17-11
17.7	Future Measures.....		17-12
18	Gas-Insulated Transmission Line (GIL)	<i>Hermann Koch</i>	
18.1	Introduction		18-1
18.2	History		18-2
18.3	System Design		18-3
18.4	Development and Prototypes.....		18-9
18.5	Advantages of GIL.....		18-21
18.6	Application of Second-Generation GIL.....		18-25
18.7	Quality Control and Diagnostic Tools.....		18-27
18.8	Corrosion Protection		18-28
18.9	Voltage Stress Coming from the Electric Power Net		18-30
18.10	Future Needs of High-Power Interconnections.....		18-32